BULLETIN
OF THE
TORREY BOTANICAL CLUB.

Vol. XVII.] New York, May 9, 1890. [No. 5.

Studies in Cell-division.

By Douglas H. Campbell.

(Plates CII. and CIII.)

The following paper was written, not so much as a contribution to our knowledge of the subject, as to call the attention of teachers of botany to several characteristic and accessible examples for demonstrating easily the most essential points in this very important subject.

It is a common idea that the study of cell-division, especially the division of the nucleus, is a very difficult subject for anyone not thoroughly versed in histological methods, and while this is in many cases true, nevertheless it is possible to find cases where these processes can be readily studied with very little aid from reagents, and indeed in some instances followed through in the living cell.

The last ten or fifteen years have seen a great advance in our knowledge of these processes. Up to about 1875, in which year the first edition of Strasburger's "Zellbildung und Zelltheilung" appeared, the general belief current was that of Hofmeister, who believed that in all cases of cell-division the nucleus first became dissolved and that subsequently new nuclei were formed from the cell-plasma previous to the division of the latter. Since the appearance of Strasburger's book the subject has attracted the attention of many of the ablest zoologists as well as botanists, among whom none have done more than Strasburger himself.

The results of these investigations show that every nucleus (with a few doubtful exceptions) arises from the division of a pre-existing one, and that among plants, at least, the origin of a nucleus from undifferentiated protoplasm never occurs.

In the simplest plants, like the Schizophytes, it is probable that in most cases the nucleus substance is not concentrated in the form of a definite nucleus, though such a body has been demonstrated in a number of the larger *Cyanophyceæ*. The latest investigations of Zacharias in this subject leave the question of the presence of nuclei in these forms still open. In these plants, especially those that are truly unicellular, or with cells only slightly coherent, we find the simplest form of fission, a mere constriction of the cell, without any participation of the nuclear substance beyond the mere mechanical separation of the portions in the two daughter cells.

In *Nostoc*, (Pl. CII. Fig. 1) we can usually find filaments in which all stages of cell-division are present, and the process is easily followed. The resting cells, (1), are nearly globular. Previous to division they elongate in the direction of the axis of the filament, (2), and a slight constriction appears in the middle of the cell, (3). Later stages (4-6) show this constriction deeper, until finally the daughter cells are completely separated by the formation of a division wall, and becoming rounded off, assume the form of resting cells.

The first plant in which the process of cell-division was carefully studied, and one of the best for showing simple fission, is *Cladophora*. The common species are found in almost every stream, and may be kept indefinitely in the laboratory.

The cells are multi-nucleate, which may be shown by fixing the cells with one per cent. chromic acid in water, thoroughly washing and staining with borax-carmine or alum-cochineal. The nuclear division is not easily shown, and takes place independently of the cell-division.

The latter may almost always be found by examining a lot of actively-growing filaments, and when once found may be followed through in the living cell. The later stages may be quickly recognized, even when but slightly magnified, the green contents of the cell being pushed away from the outer wall of the

cell by the advancing division-wall. If such filaments are now more strongly magnified and the other cells carefully examined, we shall probably find some in which the process is just beginning. In these (Pl. CII. Fig. 2) the young division-wall appears as a fine ring running around the middle of the cell, its edge directed toward the center of the cell-cavity, and pushing in the protoplasmic sac, leaving an evident clear space between the latter and the side walls of the cell. In larger cells, especially, (Fig. 7) it is very evident that the chloroplasts and other granular contents of the cell, do not occupy the extreme periphery of the protoplasmic sac, but that this is composed of perfectly homogeneous colorless plasma (Ectoplasm).

If we wish to follow the process through in the same cell, it is better to choose a rather small one, as the division does not take so long as in the larger ones. At ordinary temperature (20°-25° C.) the whole process in such cells takes from four to five hours.

The division of the inner granular protoplasm is completed some time before the division wall is closed, so that there is a neck of perfectly colorless protoplasm connecting the two green masses for some time before the connection between the daughter cells is completely severed, (Figs. 4, 5), and for some time after the division is completed the chloroplasts and other granules are contracted away from the division wall (Fig. 6).

Similar to the process just described is what occurs in the different species of *Spirogyra* and similar forms. The great difference lies in the fact that cell-division is accompanied by the division of the single nucleus of the cell.

Cell-division in the various species of *Spirogyra* takes place normally at night, but it may be retarded by suddenly reducing the temperature shortly before the time at which division would ordinarily begin, and keeping the plants in this condition until wanted. In cool weather, when the temperature sinks to near the freezing point at night, it is generally sufficient to keep the plants in a warm room during the day, and at about 10 p. m. to place the vessel containing them out of doors for the night. If they freeze slightly it will ordinarily do little harm. On bringing the plants into the laboratory in the morning, some of the cells will be pretty certain to begin division almost immediately.

The details* of the nuclear changes are not very easy to follow, but such stages as shown in Pl. CII. Fig. 8 are often met with. We find in such the division wall forming in the same way as in *Cladophora*, but near the center of the cell-lumen we find two daughter-nuclei suspended by protoplasmic threads and joined by numerous fine filaments, the outer ones of which are attached to the margins of the advancing division wall. The protoplasmic body of the cell is cut through in precisely the same way as in *Cladophora*, and finally the daughter nuclei move to the centers of the new cells.

The various desmids, especially the forms with constricted cells, show an interesting modification of the process observed in *Spirogyra*. Desmids are especially common on such fine-leaved aquatics as *Naias*, *Nitella*, *Chara*, and especially *Utricularia*, whose finely dissected leaves are often in late summer and autumn loaded down with all sorts of micro-organisms, among which are many of the most beautiful desmids. With a little care these may be kept in glass jars or other convenient vessels and will thrive for a long time. In such cultures they are not infrequently met with undergoing division, which occurs at all hours of the day.

The first sign of approaching division is the elongation of the neck connecting the semi-cells. A circular split in the wall is formed at this point and widens rapidly, forcing the original semi-cells apart, when these appear connected by a slender, colorless cylinder with much thinner walls than the original semi-cell. As this connecting cylinder enlarges it soon becomes constricted in the middle, and a division wall is formed much as in *Spirogyra*, this being accompanied by the division of the centrally placed nucleus. As division proceeds the two halves of the colorless neck enlarge rapidly, forming colorless vesicles lying between the original semi-cells which as yet contain all the colored contents of the cells. (Such a stage is shown in Pl. CII. Fig. 9). Here we find that the single large chloroplast in each half of the original cell is becoming constricted as well as the pyrenoid (p.) imbedded in it, and that the nuclear division is completed. In a somewhat later stage the lower halves of each chloroplast push down into them, and finally separate completely from the part that remains in the old semi-cell.

*Strasburger—Das Botanische Practicum—p. 612 1st. Edit.

The whole process under proper conditions, is completed in about two hours, but care must be taken that the temperature of the water in which the specimen is mounted is about the same as that from which it is taken. A marked rise of temperature is apt to kill the cells.

For studying the complicated changes that the nucleus undergoes during cell-division, as well as the method of the formation of the division-wall as it usually occurs, we must examine some of the higher plants.

For following the process in the living cell, probably no plant is better than *Tradescantia Virginica.*

Strasburger showed* that the stamen hairs of this plant were especially useful for this purpose, and has described the process so fully in several places that it will not be repeated here. For examination it is only necessary to carefully remove the stamens from young buds and mount them with the attached hairs in water or a weak (three per cent.) solution of sugar in water. It is possible to stain these† without killing them, by using a weak aqueous solution of methyl-violet, dahlia or mauvein but very little more can be seen than in the unstained cells and the process of division is retarded.

For easy demonstration of the process of karyokinesis, the final divisions of the pollen mother-cells, especially of monocotyledons, are the best subjects.

Among dicotyledons which, as a rule, are unfavorable for showing the finer details of the nuclear divisions, *Podophyllum peltatum* is a conspicuous exception, and the process will be described somewhat in detail for this plant, with some reference also to a common and easily studied monocotyledon, *Allium Canadense.* In *Podophyllum* buds should be taken just as the plants appear above ground in the spring. The same young umbel of *Allium* often furnishes different stages, and with a little care all stages may be found, and very satisfactorily shown by the following simple method: The young anthers are removed and carefully crushed in a drop of equal parts ordinary acetic acid

*Strasburger—Hillhouse, Practical Botany—(p. 356).

†Campbell—"Staining of living nuclei," Arbeiten des Bot. Instituts zu Tübingen, 1888.

and distilled water, placed on a clean slide. The pollen mother-cells will be thus set free in the fluid, which fixes them instantly. The preparation may now be examined with a low power to see if the desired stages are present. If this is the case a drop of staining fluid should be added and a cover-glass placed over the preparation. I have obtained most beautiful results by using gentian-violet. A little of a strong alcoholic solution of this stain is diluted with several volumes of weak acetic acid, (about one part acid to two of water), and a drop of the stain thus diluted is added to the preparation. As soon as the desired stain is produced, which takes but a minute or two, the stain should be carefully drawn off with blotting paper and pure water run under the cover-glass. By this process all the details of division may be easily followed, as the chromatin stains very deeply, while the protoplasm remains almost colorless. Such preparations may be kept for some time in dilute glycerine but soon fade.

The isolated spore mother-cells are characterized by their thick, irregular walls, which remain intact until the final divisions are completed. The resting nucleus of the mother-cell is large, and has a very distinct membrane. It shows an indistinctly filamentous structure, and in *Allium* has a large nucleolus at one side which colors but little, and from its position is sometimes known as "para-nucleus." It is probable that the "segments" or chromatin filaments, which later become so distinct, are even in the resting nucleus entirely disconnected, and not confluent as was formerly supposed. In *Podophyllum* the nucleolus is much less conspicuous, and early becomes indistinguishable.

As the nucleus prepares for division it increases very much in size, and the chromatin filaments become much more distinct, appearing as a tangled coil of threads, nearly filling the cavity of the nucleus (Pl. CIII. Fig. 2). These threads do not color evenly, but consist of two substances, one of which does not color at all, and later is scarcely to be seen; the other (chromatin) staining very intensely, and in the earlier stages of division showing more or less distinctly as separate portions (microsomes). These later seem to coalesce more or less completely, so that the segments of the later division-stages stain uniformly and very intensely.

The next stage (Fig. 3) shows the filaments much shortened, and very evident. They color also much more uniformly and lie in the colorless nuclear cavity, which is still separated from the cell-plasm by an evident membrane. The latter soon disappears, however, leaving the short, thick segments free in the center of the cell (Figs. 4, 5). *Podophyllum* is especially favorable for showing this stage and those immediately following, on account of the small number (about ten) of the nuclear segments. These arrange themselves in the form of a disc (nuclear-plate) across the center of the cell (Figs. 4-7K.), and each segment splits longitudinally into two similar daughter-segments, which are usually more or less distinctly bent, often being V-shaped (Fig. 6). Sometimes this division of the segments seems to begin before the disappearance of the nuclear membrane (See Fig. 3).

When the nuclear-plate is complete there may be seen, though this is often difficult in acetic acid preparations, fine lines (Fig. 7F.) converging near the poles of the cell, so as to form a spindle-shaped figure with the nuclear-plate at the equator. The whole constitutes the "nuclear-spindle," and the fibers of which it is composed, the "spindle-fibers" (*Spindelfasern* of the German authors). The spindle-fibers probably correspond in number to the segments of the nuclear-plate, but this is difficult to prove. For studying this point, alcoholic material is preferable.

As soon as the nuclear-spindle is completed the daughter segments separate and travel along the spindle-fibers to the poles of the spindle, (Figs. 8, 9). When viewed from the poles they often show a very regular, stellate arrangement, the V-shaped segments being arranged in a circle with the free ends outward.

As the two sets of segments separate, fine lines may be detected connecting the young nuclei (Pl. CIII. Figs. 8-12 V.) These "connecting threads" (*Verbindungsfäden*) are much more numerous than the spindle-fibers. After reaching the poles, the daughter nuclei pass through much the same phases, but in reverse order, that preceded the division of the primary nucleus (see figs. 10-13). About the time that the nuclear membrane becomes evident, or sometimes a little earlier, a plate composed

of small granules appears in the middle of the space occupied by the connecting threads, and careful examination shows them to be knot-like thickenings of the latter (Fig. 11 C.) This structure is the "cell plate," and usually is the beginning of a division wall (Pl. CII. Figs. 12-14). In this case (*Allium*) new connecting threads are formed, running to the circumference of the cell plate, thus increasing its size until finally it reaches completely across the cell (Fig. 13). The separate microsomes of which it is composed now coalesce and form a complete membrane, that divides the mother cell into two. In *Podophyllum* and most other dicotyledons, the primary cell-plate disappears without forming a continuous membrane, though the indication of a division is often evident even after the connecting threads are no longer evident. (Pl. CIII. Fig. 13).

Each of the daughter-nuclei now goes through the same process described for the primary nucleus, but when the ripe spores are arranged tetrahedrally, as in *Podophyllum*, the four nuclei resulting from the final division arrange themselves about the periphery of the cell at equal distances from each other, and connecting threads are formed between them in all directions (Pl. CIII. Fig. 17). A cell-plate is now formed between each pair of nuclei, extending to the center of the cell, thus forming four tetrahedral cells—the young pollen-spores. The division wall is formed in part also by a ridge which projects inward from the wall of the mother cell (Fig. 19). The division walls become finally very thick, so that the young pollen spores appear to be embedded in a thick colorless matrix. This thick wall is finally absorbed, setting free the spores and these soon acquire their characteristic covering.

In *Allium* and most monocotyledons, the spores are of the "bilateral" form, and in these a dividing membrane is formed after each nuclear division. The division of the daughter-nuclei in these frequently takes place in planes at right angles to each other (Pl. CII. Figs. 10, 14).

Direct nuclear divisions (*i. e.*, constriction of the nucleus without any further change) is known in a few cases, but always takes place in the older cells. The older parenchyma cell of the stem of *Tradescantia Virginica* and the internodal cells of *Chara* and

Nitella furnish common instances. They may be treated with acetic acid and gentian-violet as described, in the latter case cutting the long cells across and forcing out the contents with a needle or fine forceps.*

EXPLANATION OF FIGURES.

(Plate CII.)

Fig. 1.—Filament of *Nostoc* × 350.

2–6.—*Cladophora* (sp?) Showing process of cell-division followed in the same cell. Fig. 2, drawn at 9:30 A. M. Fig. 6, 2:05 P. M. × 300.

7 —A much larger cell of the same × 175.

8.—A dividing cell of *Spirogyra* (sp?) × 300.

9.—A Desmid in process of division; n. the nucleus; p. pyrenoid.

10–14.—Final divisions of the pollen-spores of *Allium Canadense*. Acetic acid, gentian violet × 350. In Fig. 10 the nuclear spindle in the left-hand cell is seen from the pole.

(Plate CIII.)

Division of the pollen-spores of *Podophyllum peltatum*. All the figures were drawn from acetic acid, gentian violet preparations, and all but six are magnified about 625 diameters, the latter about 1200.

Figs. 1–13.—Division stages of the primary nucleus of the mother-cell. Figs 5–6 seen from the pole, the others from the side.

14–20.—Division of the secondary nuclei and formation of the spores.

21.—Two young isolated pollen-spores.

N–Nucleus; K–Nuclear-plate; F–Spindle-fibers; C–Cell-plate.

On the Naming of "Forms," in the New Jersey Catalogue.

In a recent number of the BULLETIN, (Vol. xvi. 272) when remarking on Mr. Cockerel's paper on the naming of slight varieties, I stated that I had introduced the term "forma" into the Catalogue of Plants found in New Jersey, as a rank to include physiological deviations or variations, such as color, odor and size, reserving for the term "varietas" such as are manifestly structural. I noted at that place that it was indeed difficult to rigidly separate even these characters, so that very slight structural deviations in the size of organs or their number or amount of division, might best come under the rank of "forma." I think that it is only in the latter sense that the term has been used by European authors, especially of the German school, and in their microscopic habits of thought, attempts have been made to attach

*See Strasburger-Hillhouse, p. 369 for *Tradescantia*; "Botanisches Practicum," 1st edit. p. 516 for *Chara* and *Nitella*.

"forma" names to structural peculiarities which we would, in our broader view of nature, pass by as mere individual differences. I do not wish it to be supposed that I approve of any such practice. From my point of view the terms "varietas" and "forma" need not be of different value in classification, although in fact, they generally would be. It would be as difficult to decide in some cases between "species" and "forma," as between "species" and "varietas." There are, I believe, no structural differences between *Datura Tatula* and *D. Stramonium*, but they are believed to have originated in different parts of the world, and the color character of the corolla is, so far as I am aware, constant. There is little but the color of the flowers to separate the American *Nasturium lacustre*, Gray, from the European *N. amphibium*. It appears therefore, that the very characters on which I would base "forma," may be quite as constant as morphological ones universally recognized as specific.

This brings up the whole question of what we should agree upon as constituting a "species." There are no fixed lines in nature. The whole vegetable kingdom is so interlocked by the tendency to variation, working simultaneously with the efforts towards atavism and heredity, that structures are continually produced which defy any system of classification. We are forced to admit, and it ought to be further emphasized in our text books, that intermediate forms may occur between any related groups or individuals, or as Prof. Oliver has put it, "no characters are constant." It is, I believe, useless at the present stage of knowledge to argue that all "species" are rigidly distinct and can be separated by carefully drawn descriptions, if once their characters are understood. Some are naturally more permanent than others, but this will not allow of a sweeping generalization.

It ought to be posssible, however, to adopt some considerations which should guide us all in the elucidation of the problem, and this might well form a feature in an extended discussion. But I do not propose to enlarge further on these general matters at the present time. I wish to speak particularly of the instances which have come under my observation in working out the New Jersey Flora, which list is now about ready for distribution.

Anemone nemorosa, L. forma *quinquefolia*, (L.) (*A. quinquefolia*, L. Sp. Pl. 541; *A. nemorosa*, L. var. *quinquefolia*, Pursh, Fl. Am. Sept. 386.) This differs only from the ordinary state of the eastern American plant, called in all recent books *A. nemorosa*, in the lateral leaf divisions being again divided. This is, indeed, the general condition of the radical leaves, and there are all gradations traceable. As a matter of fact, I now regret having ever written it up in this way, but the early signatures of the catalogue being printed, some explanation of my motive should be made. I am now convinced that our plant is distinct from the European, as was long ago forcibly argued by Barton* and should be called *A. quinquefolia*, L.† A long series of European *nemorosa* and Atlantic American *quinquefolia*, seem to me to show remarkably constant differences. The few West Coast specimens referred to *nemorosa* that I have had opportunity to examine seem again distinct from either,‡ while in the plant of the southern Alleghenies which I have seen in Mr. Canby's herbarium, we must have the genuine Central European *A. trifolia*, as indicated by Dr. Gray (Amer. Nat. vii. 422.)

Castalia odorata (Dryand.), Woodv. & Wood, forma ROSEA (Pursh.) (*Nymphæa odorata*, var. *rosea*, Bennett, Rhode Island Catalogue.) Flowers large, pink or purple. It has long seemed to me that this striking and beautiful form of the water lily was entitled to a name. It is very well known to exist at various points along the Atlantic coast from Massachusetts to New Jersey, whence I have specimens collected by Mr. Commons near Cape May, and Dr. Lockwood reports it as growing near Manchester and Woodstown.

Aquilegia Canadensis, L. forma FLAVIFLORA (Tenney). (*A. flaviflora*, Tenney, Amer. Nat. i. 389. *A. Canadensis*, L., var. *Phippenii*, Robinson, Flora Essex County. *A. Canadensis*, L., var. *flaviflora*, Britt. Bull. Torr. Club, xv. 97. This manifestly falls into the rank of forma, and the yellow color appears to be perfectly constant.

Viola pedata, L. forma BICOLOR, (Pursh.) (*V. pedata*, var.

---

* Comp. Flor. Phila. ii. 20; Fl. N. A. ii. 10.

† I have so designated it in the Addenda to the New Jersey Catalogue.

‡ *A. Grayii*, Kell. and Behr.

bicolor, Pursh). This also offers very constant color characters, so far as I am informed, but I can make out no structural differences betweeen it and the type.

Viola pedata, L. forma ALBA (Thurber). (*V. pedata*, var. *alba*, Thurber, Bull. Torr. Club, i. 20). Evidently an albino. It occurs with the typical plant, and transitional colors are common.

Viola palmata, L. forma *striata*, Willis, Bull. Torr. Club, xvi. 278. This is the pubescent upland plant, with lobed leaves. In spite of the great amount of work done on our eastern violets, I do not yet believe that they are understood. They can only be known through the accumulation of a great amount of herbarium material, and long-continued field observation. The time of blooming is very different in some of the kinds now referred to *V. palmata*, from which I suspect *V. cucullata* to be abundantly distinct.

Viola cucullata, Ait., forma ALBIFLORA. Flowers white. An albino, not uncommon with the type, or what I take to be the type.

Lupinus perennis, L., forma ROSEA. Flowers beautifully pink. May's Landing, Atlantic Co., Dr. J. E. Peters.

Epilobium spicatum, Lam. forma ALBIFLORUM. Flowers white. North Spring Lake, Lighthipe.

Aralia nudicaulis, L., forma PROLIFERA (A. C. Apgar). (*A. nudicaulis*, L., var. *prolifera*, A. C. Apgar, Bull. Torr. Club, xvi. 166). Described from specimens collected near Lambertville, N. J.; since found by Miss P. A. McCabe at White Plains, N. Y.

Vernonia Noveboracensis, (L.), Willd., forma ALBIFLORA. An albino of occasional occurrence.

Eupatorium perfoliatum, L., forma PURPUREUM. Flowers purple. Budd's Lake, Dr. Porter.

Liatris spicata, (L.), Willd., forma ALBIFLORA. An albino found by Rev. Mr. Lighthipe near Bay Head.

Solidaga odora, Ait., forma INODORA (Gray). (*S. odora*, var. *inodora*, Gray. Man. 244). Quaker Bridge, Leggett.

Cnicus altissimus, (L.), Willd., var. *discolor*, (Muhl.), Gray, forma ALBIFLORA. An albino from Carlstadt, Rev. R. E. Schuh. Found also on Long Island and Staten Island.

Lobelia syphilitica, L., forma ALBIFLORA. An albino of occasional occurrence.

Gaylussacia resinosa, (Ait.), T. and G., forma LEUCOCARPA (Porter). (*G. resinosa*, var. *leucocarpa*, Porter, Bull. Torr. Club, xvi. 21). In my view better referable to this rank.

Sabbatia stellaris, Pursh., forma ALBIFLORA. Flowers white. Not uncommon.

Gentiana Andrewsii, Griseb., forma ALBIFLORA. An albino, found at Tenafly by Dr. Milton Turnure, and known also from Pennsylvania.

Phlox subulata, L., forma ALBIFLORA. Flowers white. Lambertville, A. C. Apgar.

Gerardia purpurea, L., forma ALBIFLORA. Flowers white. An albino of occasional occurrence.

Gerardia tenuifolia, Vahl, forma ALBIFLORA. Flowers white. An albino found by Mr. Leggett at South Amboy, and by Mr. Schuh at Rosemont.

Brunella vulgaris, L., forma ALBIFLORA, (Bogenhard). (*B. vulgaris*, var. *albiflora*, Bogenhard, Fl. Jena. 315). Flowers white. Found by Mr. Lighthipe at Woodbridge.

Calopogon tuberosus, (L.), B. S. P., forma ALBIFLORUS. Flowers white. May's Landing, Dr. Peters.

Sisyrinchium angustifolium, Mill., forma ALBIFLORUM (Raf.) (*S. albiflorum*, Raf.) Found at Point Pleasant by Prof. E. H. Day, and at Freehold by Dr. Lockwood.

Lilium Canadense, L., forma RUBRUM. Flowers red. Near West Milford, Passaic Co., Britton, and reported from Bergen Co. by Mr. Woolson.

Tradescantia Virginica, L., forma ALBIFLORA. Flowers white. Found by Dr. Porter at Holland, Hunterdon Co.

Sagittaria sagittæfolia, L., forma OBTUSA (Willd.), (*S. obtusa*, (Willd.); forma LATIFOLIA (Willd.), (*S. latifolia*, Willd.); forma HASTATA (Pursh); (*S. hastata*, Pursh), forma ANGUSTIFOLIA (Engelm.), (*S. variabilis*, var. *angustifolia*, Engelm.); forma GRACILIS (Pursh), (*S. gracilis*, Pursh.)

I am of the opinion that the reference of this species known in the Manuals as *S. variabilis*, Engelm., to the Old World *S. sagittæfolia*, as Micheli has it in DeCandolle's Monographs,

Vol. iii. 66, is the most satisfactory disposition of it, and that the varieties named by Dr. Engelmann in the fifth edition of Gray's Manual are better regarded as forms.

N. L. BRITTON.

On Buxbaumia indusiata, Bridel.

In a small collection of mosses lately sent from the new State of Washington by Mr. Charles V. Piper, there were a few small specimens of *Buxbaumia*, which were found growing on wet logs at Seattle in June, 1889. The plants were still attached to bits of the log, and were surrounded with *Tetraphis pellucida*, a *Hypnum* and five species of Hepaticæ.* The wood of the log is reddish-brown in color, and is plainly coniferous; it may be *Thuya gigantea*. The plants of *Buxbaumia* are rather over-mature, and have lost their opercula, and the outer peristome is pretty much gone also. The capsules are irregular in shape, but on the average more ovate-cylindrical than those of *B. aphylla*, and are paler in color. Recognizing them as probably *Buxbaumia indusiata*, it became desirable to prove them to be this species, the existence of which in the western hemisphere had never to my knowledge been announced or even suspected.

I could not obtain a satisfactory peristome, and though the habitat, on wet decaying logs, the shape of the capsules and the color were all that one should look for in *B. indusiata*, something more was wanting. Noticing that Schimper says that the spores of *B. indusiata* are thrice the diameter of those of *B. aphylla*, I compared the spores of the Washington plant with those of *B. aphylla* from Connecticut, and found them about two and a half times larger, and all doubt of the reality of Mr. Piper's most interesting discovery vanished.

Mrs. Britton, on learning of this discovery, most kindly shared with me a few plants of a *Buxbaumia* collected March 23, 1889, by Mr. J. B. Leiberg on decaying logs in Kootenai County, Idaho, and these also proved to be *B. indusiata*, one or two of them

*Prof. Underwood has kindly identified these Hepaticæ; *Aneura palmata* is the most abundant species; the others are *Cephalozia multiflora*, *C. bicuspidata*, *Jungermannia incisa* and *Blepharostoma trichophyllum*. The *Hypnum* is apparently a young plant of *Plagiothecium undulatum*.

showing the characteristic conical operculum, and the spores also being large. The same lady then sent me for examination all the *Buxbaumias* in the Columbia College Herbarium, and among them, to my delight, I found three plants of unmistakable *B. indusiata* collected in October, 1869, by Professor C. H. Peck, "on rotten logs in a swamp, Catskill Mts." These plants have the conical opercula in perfect condition, but the spores are not quite mature, and run a little smaller than in the Washington specimens. Professor Peck writes me that the station must be "in the immediate vicinity of Haines' Falls, probably in the swampy lowland between Haines' Falls and Tannersville." Examination of the spores of both species, both American and European, shows some variation in size; but the average diameter of the spores of *B. indusiata* is from twice to twice and a half that of those of *B. aphylla*.

It may perhaps be questioned whether the moss collected by Lyall in the Cascade Mountains, and referred to *B. aphylla* in the Flora of California, be not the rarer species; but the specimens are not now in America. Leaving them out, I find no evidence that *B. aphylla* has been found west of Ohio. The most evident differences between the two species may be set side by side in the following manner:

B. aphylla.	*B. indusiata.*
Capsule shining, reddish, obliquely ovate, much flattened on the upper side, the external cuticle firm and persistent.	Capsule dull, pale, sub-erect, ovate-oblong, more tapering, but slightly flattened, the external cuticle at length ruptured along the flattish side and revolute.
Operculum thimble-shaped.	Operculum conical.
Outer peristome simple.	Outer peristome triple or quadruple.
Spores small (5-8μ).	Spores about twice or twice and a half the size of those of *B. aphylla* (10-16μ).
Habitat; on earth.	Habitat; on decayed logs.

Now that *B. indusiata* is known to be American as well as European, all moss lovers will be on the lookout for it, and I doubt not that it will be found on decaying coniferous logs all the way from New England to the Pacific. I will gladly receive and examine any specimens that may be sent me.

New Haven, March 22, 1890. DANIEL C. EATON.

Index to Recent American Botanical Literature.

Abutilon vexillarium. W. W. (Garden, xxxvii. 274, 275, plate 745).

Anemone Hepatica.—Dates of Flowering of. Arthur Hollick. (Proc. Nat. Sci. Assn. of S. I., March 13, 1890).

The earliest recorded dates of blossoming for this species on Staten Island, are tabulated for the past twenty years, from which it appears that February 16th, of the present year, is by far the earliest during the entire period.

Aster ptarmicoides. (Garden & Forest, iii. 152, fig. 27).

Arrangement of Genera in the National Herbarium.—The System of. F. V. Coville. (Bot. Gaz. xv. 68, 69).

Boldo. H. H. Rusby. (Reprint from Drug. Bull., March, 1890, illustrated).

Under this caption is an account and picture of *Peumus boldus*, Molina.

Botanical Study.—Methods of. W. J. Beal. (Garden & Forest, iii. 174, 175).

Campanula rotundifolia. (Garden, xxxvii. 225, illustrated).

Cardon Forest.—A. T. S. Brandagee. (Zoe, i. 26).

"Cardon" is the popular name by which the Mexicans designate *Cereus Pringlei* and *C. pecten-aboriginum.*

Crossosoma. Frank H. Vaslit. (Zoe, i. 27).

In this article the statement is made that: "it is doubtful whether the second species, *C. Bigelovii* is anything more than a depauperate variety of the first," (*C. Californicum*).

Cypress of Montezuma.—The. (Garden & Forest, iii. 150, fig. 28).

An account of a famous tree of *Taxodium distichum*, growing near the city of Mexico. Its height is about 170 feet, and girth about 50 feet. Its age is computed at about 700 years. Many gigantic individuals of this species are known throughout Mexico and Central America, where they grow in comparatively dry ground, and without the "knees" which are such prominent features in the more northern swamps. The figure represents the base of the trunk.

Cypress.—The Deciduous. (Gard. Chron. vii. 324, figs. 49 and 50, and Plate).

From this account and picture we may understand how the "knees" appear when the tree is grown in England. The article includes a general review of the recent discussion of "knees" by American botanists.

Ergot in 1889.—*Prevalence of.* Erwin F. Smith. (Journ. Mycol. v. 202-204).

Erysipheæ of Montana.—A Preliminary List of the. F. W. Anderson. (Journ. Mycol. v. 188-194).

A list of twelve species, with their host plants.

Erysipheæ upon Phytoptus Distortions. F. W. Anderson and F. D. Kelsey. (Journ. Mycol. v. 209, 210).

Eupatorium probum. N. E. Brown. (Gard. Chron. vii. 321, fig. 48).

This species is here described as new, with the information that it has been known in cultivation for twenty years, having been introduced from Peru about 1870, and yet has remained undescribed until the present time.

Flora of the Santa Barbara Islands.—On Certain Peculiarities in the. J. W. Fewkes. (Am. Nat. xxiv. 216-224).

The present flora of the Santa Barbara Islands is believed by the author to most nearly resemble the former flora of the adjacent mainland, prior to the time when this latter was modified by recent climatic changes. It is supposed that many species suffered almost or complete extinction in the struggle for existence with the plants driven southward by the cold of the ice age, and westward by the gradual desiccation of the arid regions, whereas the island flora would be exempt from these influences. The significant fact is noted that many plants which are only represented by a meagre number on the mainland, are abundant on the islands, and the genus *Lavatera* is said to be represented by four species on the island of Santa Cruz, while there is not another species known on the American continent. Similar facts in the zoölogy of the islands are also noted. Where isolated colonies of the insular flora have been found on the mainland, they may be supposed either to be the last remnants of the original stock, or possibly a recent incipient colonization from the Islands.

Fungi.—North American. Part III. A. P. Morgan. (Journ. Cin. Soc. Nat. Hist. xii. 163-172, Pl. XVI. Reprinted).

Tylostoma verrucosum and *T. campestre* are described as new and figured. Figures are also given of *Tylostoma mammosum*, *T. fimbriatum*, *T. Meyenianum*, *Clavatia craniformis* and *C. elata*.

Fungous Diseases of the Onion (*Allium Cepa*).—*On Certain*. Roland Thaxter. (Ann. Rep. Conn. Agric. Exp. Sta. for 1889, report of the Mycologist).

The following are figured: *Urocystis Cepulæ*, *U. Colchici*, *U. magica*, *U. Anemones*, *U. occulta*, *U. Hypoxys*, (n.sp.), *Ustilago Maydis*, *U. segetum*, *Phytophthora Phaseoli*, *Macrosporium sarcinula*, var. *parasiticum*, *M. Porri*, and *Vermicularia circinans*.

Hemlock.—The. A. N. Prentiss. (Garden and Forest, iii. 157, 158, fig. 29).

Heuchera from Montana.—An Undescribed. D. C. Eaton. (Bot. Gaz. xv. 62).

Heuchera Williamsii is described as new, collected by Mr. Robt. S. Williams in and near the Belt Mountains, Montana.

Jamaica.—Bulletin No. 16 of the Botanical Department. (Govt. Printing Est., Jamaica, Nov. 1889).

Lælia glauca. (Gard. Chron. vii. 356, fig. 52).

Liability of Trees to Disease.—The Comparative. J. G. Jack. (Garden & Forest, iii. 176-178).

Under the heading of "disease" are included all causes of injury to vitality of the tree, such as insects, fungi, etc. A list of trees is given, with the pests by which they are afflicted.

Licheni Patagonici Raccolti Nel 1882 *Dalla Nave Italiano Caracciolo.* A. Jatta. (Giorn. Bot. Ital. xxii. 48-51).

Licheni Raccolti Nello Scioa Dal Marchese Antinori. A. Jatta. (Giorn. Bot. Ital. xxii. 51, 52).

Lily Disease in Bermuda. A. L. Kean. (Annals of Botany, iv. 169, 170).

List of Plants Collected on the Rupert and Moose Rivers, along the shores of James Bay and on the Islands in James Bay, during the summers of 1885 *and* 1887. J. M. Macoun. (Ann. Rep. Geol. Surv. Canada. iii. 63j-74j, 1889).

List of Plants Collected by Dr. G. M. Dawson in the Yukon District and Adjacent Northern Portion of British Columbia, in 1887. J. Macoun. (Ann. Rep. Geol. Surv. Canada, iii. 215b-228b, 1889).

Manual.—The New. William Trelease. (Bot. Gaz. xv. 71-74).

There was naturally considerable interest expressed as to the review of this work, which would probably appear in the Gazette. The reviewer's estimate of the work in general is so entirely in accord with that of all who have examined it, that we cannot do better than quote from his words: "As a book it is every bit as good as the last edition. * * * As a manual for convenient use, it is considerably better." When, however, the attempt is made to explain the shortcomings in nomenclature, it becomes a case of "*qui s'excuse s'accuse.*" We shall take the space to make a somewhat liberal quotation. "Had the new edition of the Manual appeared after a lapse of time since Professor Gray's death, it would undoubtedly have shown a greater number of unfamiliar names than is now the case; but it is gratifying to find that in an edition planned by him, a conscientious effort has been made to conform as far as possible to his views regarding the limitation and nomenclature of species. * * * The editors will doubtless be criticised for this feature of their work, since there is now an unmistakable disposition to fix the earliest used specific name as that of the species, under whatever genus this may have been placed, a tendency which in some quarters reaches for both generic and specific names back of the Linnæan introduction of binomials. * * * Although the tendency referred to repudiates in several important respects the code adopted by the Congress of 1867, which was framed by botanists quite as wise in their day and generation as any who now pass judgment on their views, it cannot be denied that a rigid application of the principle of priority can scarcely lead to any other result; and it may be that with the concurrence of the next generation the temporary instability of the nomenclature will finally give the real stability that all botanists desire. * *

* In this connection, however, attention ought to be called to the unadopted changes in generic names in the *Nymphæaceæ* that have recently been discussed in the BULLETIN OF THE TORREY BOTANICAL CLUB, and to the unaccepted substitution of *Hicoria* for the familiar *Carya*. However it may be with these genera, it is to be regretted that *Spergularia* of the old edition appears in this edition as *Buda* and not *Tissa*."

Manual.—The New. C. E. Bessey. (Am. Nat. xxiv. 278, 279).

Professor Bessey, in a quiet way, voices the disappointment of all progressive botanists, that the Manual should have failed to commend itself to any except those who are wedded to old and rapidly decaying ideas. He says: "The time-honored arrangement of orders, time-honored genera, the time-honored rules as to capitalization, punctuation and citation of authorities, are strictly adhered to. The gymnosperms are still wedged in between monocotyledons and dicotyledons; *Carya* is *Carya* still. * * * *Nymphæa* is *Nymphæa* still. * * * We had hoped for something different. Meanwhile we are glad to get the book, for it was much needed."

Manual of the Botany of the Northern United States. T. S. B. (Zoe, i. 30).

In this review of the new edition of Gray's Manual, the reviewer says: "Very few names are changed, a matter of congratulation in the present unsettled state of botanical nomenclature. It will be quite time enough to make these changes in text books and manuals when some degree of permanency shall have been reached." We fail to see how permanency can ever be reached, so long as compilers of text books and manuals are content to use any names that may suit their fancy. There is evidently not a consensus of opinion between T. S. B. and the writer on page 1 of the same publication.

Massangea hieroglyphica. (Garden, xxxvii. 244, illustrated).

Mousses Nouvelles de L'Amerique du Nord. F. Renauld et J. Cardot. (Bull. Soc. Roy. Bot. xxviii. 125-134, tt. vii-ix).

This is a translation of the description and a reprint of the plates already published in the *Botanical Gazette* for April, 1889, with the exception of a few additional remarks under *Dicranum Howellii.*

Mycological Notes. Geo. Massee. (Journ. Mycol. v. 184-187, pl. xiv.)

Stella Americana is described as a new genus and species, from Lower Carolina.

Necessity for a Redescription of the Type Species in Kew Herbarium. B. T. Galloway. (Journ. Mycol. v. 215, 216).

The author says: "There are over seven thousand type spec-

imens of fungi in the Kew Herbarium, but every mycologist knows that in the majority of cases the descriptions of these are so meagre, and the figures so inaccurate, that it is absolutely impossible to use them in the determination of species."

Nomenclature of Organic Life.—The. H. W. Harkness. (Zoe, i. 1-4).

Old time conservatism will find but little comfort in this article, as: "The rigid enforcement of the law of priority seems to give the best promise of a stable nomenclature—a boon so precious that even a very considerable preliminary confusion may well be endured in the prospect of attaining it. To be in any degree effectual, it should be enforced without any of those exceptions upon which systematists soonest and most completely split." The author would retain the most incongruous specific name, or a barbarous combination of names, rather than infringe upon this law. In regard to the citation of authorities, a method of escape is suggested in the citation "of the place of publication or page of an index, to which sooner or later all such matters are likely to be relegated." We should like this suggestion to be made a little clearer, and, in view of the fact that the subject is attracting a great deal of attention and interest at the present time, would make bold to ask that an example be given of just what is intended—for instance, we fail to grasp exactly how page 20 of Zoe would appear if the above suggestion were applied to it.

Notes on Some Western Plants. J. N. Rose. (Bot. Gaz. xv. 63-66, pl. X).

Pentstemon Tweedyi, Erigeron Parryi, E. Tweedyana, and *Chorizanthe Vazeyi* are described as new, the latter figured.

Onion Disease in Bermuda. A. L. Kean. (Annals of Botany, iv. 170, 171).

The question whether *Macrosporium parasiticum* or *Peronospora Schleideniana* is the cause of the disease does not yet seem to be settled.

Panicum virgatum. F. H. (Garden, xxxvii. 245, illustrated).

Parry.—Dr. Chas. C. (Bot. Gaz. xv. 66-68).

Perenospora Cubensis, B. & C.—New Localities for. B. T. Galloway. (Journ. Mycol. v. 216).

Specimens have lately been received from Anona, Fla., and College Station, Tex.

Penicillium and Corrosive Sublimate. J. M. Coulter. (Bot. Gaz. xv. 69, 70).

The fact is here noted that a rank growth of *Penicillium glaucum* was found growing upon a mass of flour paste strongly impregnated with corrosive sublimate.

Peronosporeæ for 1889 *in New Jersey.—Some Notes Upon Economic.* Byron D. Halsted. (Journ. Mycol. v. 201-203).

Notes are given upon *Peronospora Cubensis, Phytophthora infestans, P. viticola, P. Violæ,* and *Cystopus Ipomœæ-panduratæ.*

Platanus.—The Palæontologic History of the Genus. L. F. Ward. (Reprinted from Proc. U. S. Nat. Mus. xi. plates XVII-XXII, 1888).

The close relationship existing between the many fossil species of plants which have been named from time to time under the genera *Platanus, Aralia, Araliopsis, Sassafras,* etc., is here pointed out, and the significance of the peculiar basal appendages to the leaves is emphasized. In the older representatives of the genus *Platanus* these were very pronounced, and their aborted remains are yet to be seen, especially in connection with leaves upon young shoots and trees of *Platanus occidentalis.* The plates are admirably designed to illustrate the argument of the text, and contain representations of *Aralia notata,* Lx., *A. digitata,* Ward, *Aspidophyllum trilobatum,* Lx., *A. dentatum,* Lx., *Platanus basilobata,* Ward, *P. appendiculata,* Lx., *P. occidentalis,* L., *Sassafras officinale,* Nees and *S. Cretaceum,* Newb.

Pinus Jeffreyi. W. Coleman and J. B. Webster. (Garden, xxxvii. 280).

An account of its introduction and growth in Great Britain, and hints for its proper cultivation.

Prestœa Carderi. (Bot. Mag. Tab. 7108).

Piperaceæ Costaricences Novæ. (Comp. Rend. Séance, Soc. Roy. Bot. Belg., Année 1890, 69-71).

Piper Pittieri, P. pulchrum, C. DC., var. *Costaricense, Peperomia Tonduzii, P. chrysocarpa, P. barbana* and *P. palmana* are described as new by M. C. DeCandolle.

Pyrenomycetes.—Contributions to the History of the Development

of the. Franz von Tavel. (Journ. Mycol. v. 181-184) pl. XIII, continued).

Cucurbitaria Platani is described as new.

Root Fungus of New Zealand. R. A. Wright. (Journ. Mycol. v. 199, 200).

The author questions the statement of Professor Kirk, that it is *Lycoperdon gemmatum*, but does not determine the species himself.

Rust of Flax. B. T. Galloway. (Journ. Mycol. v. 215).

This fungus (*Melampsora lini*) which is found upon our native *Linums* and has occasioned considerable trouble abroad in the cultivated flax fields, does not seem as yet to have attacked the crops in this country.

Shortia galacifolia. (Garden, xxxvii. 290). A short note to the effect that the plant is now in flower at Kew, "and, judging from its health and vigor, is likely to become popular."

Slover Mountain.—The Botany of. S. B. Parish. (Bot. Gaz. xv. 51-53).

Sorghum Blight.—Status of the. W. A. Kellerman and W. T. Swingle. (Journ. Mycol. v. 195-199).

The question of priority in publication of investigations concerning this organism is discussed and citations quoted.

Sports. M. T. Masters. (Garden & Forest, iii. 162-164).

In this article the author gives us the latest facts in regard to hybridization, influence of stock on scion and *vice versa*, sex variation, cell life, etc., and their influence in the production of sports in the vegetable world.

Tillandsia usneoides. (Garden, xxxvii. 221, illustrated).

Uroglæna Volvox, Ehr. S. W. Williston. (Microscope, x. 81, 82).

Willows.—Notes on North American. V. M. S. Bebb. (Bot. Gaz. xv. 53-56).

In this contribution the author gives us interesting and critical notes upon *Salia Hookeriana, S. myrtillifolia, S. arbusculoides* and *S. subcordata.*

Woods.—Microscope Study of. Henry L. Tolman. (Am. Month. Mic. Journ. xi. 49-56, figs. 1-9).

Sections of *Pinus Lambertiana, P. ponderosa, P. australis, P. Strobus, Taxodium distichum, Abies Douglasii, Sequoia sempervirens, Rhus toxicodendron* and *Juglans nigra* are figured.

Proceedings of the Club.

The regular meeting was held Tuesday, April 8th, at Columbia College, the President in the chair and 23 persons present.

Mr. R. W. Gardner was elected an active member.

The death of Dr. Geo. Thurber, an ex-President of the Club, was announced.

Dr. Britton showed *Ranunculus hederaceus* collected by Rev. Arthur Waghorne in Newfoundland, this being a new station for the plant, hitherto known as North American only from Virginia.

Dr. Rusby spoke of the desirability of the Club directing some instructive work in Botany. The matter was referred to a committee of five. "The Characeæ," by T. F. Allen, M.D., the lecture announced for the evening, then followed.

The second April meeting was held on Wednesday evening, at Columbia College, the President in the chair and 32 persons present.

Mrs. Gen. Lewis Fitzgerald, Mr. Henry Kraemer and Mrs. J. L. Lewis were elected active members.

The Chairman of the Committee on Instruction reported favorably and recommended that a permanent Committee on Instruction be appointed; that the present season's course consist of ten afternoon Lectures given at the College of Pharmacy, alternating with ten Saturday excursions, the whole course to terminate about July 1st, and that the fee for each member of the class shall be five dollars. The President appointed on such committee, H. H. Rusby, J. S. Newberry, Emily L. Gregory, Wm. E. Wheelock, Elizabeth G. Britton, Henry Kraemer and Arthur Hollick.

The Committee on Botanic Garden reported progress and on motion was enlarged to eleven members.

Prof. Porter delivered the lecture of the evening, entitled "A Memoir of Linnæus."

Report of Field Committee for the Year 1889.

In presenting this report I am obliged to announce the great difficulties which your committee has experienced on account of the excessively stormy season. Many of our meetings have been

entirely prevented, or the attendance reduced to its lowest terms. Some of our most successful meetings have been held in the face of the storm.

The first field meeting of the season was at South Amboy, New Jersey. But few plants were collected, the important ones being *Epigæa repens* and *Pyxidanthera.*

The next meeting of April 27th to Richmond Hill, Long Island, was entirely prevented by the storm.

On May 4th the Club met at Van Courtlandt, New York, upon which occasion 40 species were collected, the most interesting being *Ranunculus fascicularis, Silene Pennsylvanica, Trillium cernuum, Diclytra Cucullaria.*

Upon the 11th of May we met at Bronx Park, New York, Miss E. Cannon appointed as guide. This meeting was of special interest, as it enabled the members to survey the site which has been deemed most appropriate for the New York Botanical Garden. Miss Timmerman reports 65 plants as collected this day, the most interesting being a *Ranunculus* doubtfully referred to *R. Pennsylvanicus, R. septentrionalis, Corydalis sempervirens, Viola pedata, Staphylea trifolia, Myrica cerifera.*

On May 18th, under the guidance of Miss L. M. Stabler, we visited Pelham Manor, New York, and collected 47 species, among them *Arabis lyrata, Saxifraga Pennsylvanica, Rhododendron viscosum, Aphyllon uniflorum* and *Trientalis Americana.*

On May 25th Mrs. Britton conducted the party to Prince's Bay, Staten Island, the meeting being one of unusual interest, 49 plants being recorded. Among those more especially worthy of mention were *Viola primulæfolia, Oxalis violacea, Leucothoe racemosa, Melampyrum lineare, Veronica Chamædrys, Ornithogalum umbellatum* and *Isoetes Engelmanni.*

On May 30th, Decoration Day, your speaker was appointed to conduct the Club to Montclair Heights, a most interesting locality. The morning proved stormy, and on arriving at the railway station I found but a single member, Mr. Martens, prepared to accompany me. We attended the locality and my friend was rewarded by finding a single specimen of the rare *Obolaria Virginica* and two or three pretty specimens of *Liparis.*

The next meeting of June 1st, to Soho, New Jersey, was entirely prevented by the storm.

Upon June 7th, 8th and 9th the most important meeting of the season was held at Naomi Pines, a small settlement some four miles distant from Pocono Summit, Pennsylvania. This excursion might well be made the subject of a special paper, not only because of the pleasure afforded to the visitors, but because of the importance of the discoveries made. The Philadelphia Academy of Sciences had been invited to join us, and had sent quite a large delegation. Visitors were also present from Easton, Pennsylvania, and other points. The meeting was conducted by Prof. Thomas C. Porter, who was well acquainted with the locality. Great energy was exhibited by the explorers, and the entire three days comprised a continuous round of the most happy experiences, both scientific and social. I do not remember to have heard a single member of the party express the opinion that they had ever enjoyed a similar event more. 141 species are recorded as having been collected. Perhaps no other collection exceeded in interest that of the *Caltha flabellifolia*. This species, originally collected by Pursh, has been omitted from our manuals on the ground of doubts as to its genuineness. Prof. Porter's rediscovery of it at this point leaves no doubt as to the fact. It grows in spring water, has very small flowers and is markedly different from any other United States form. *Coptis trifolia* was abundant in fruit, and presented a fine appearence. In a field was found a large patch of *Aquilegia vulgaris* which had escaped from cultivation and had reached a perfection of beauty which none of us had ever seen presented by the cultivated plant. Those members who were not accustomed to a northern or white pine flora, were greatly interested in seeing *Viola rotundifolia*, *Oxalis Acetosella*, *Nemopanthes mucronata*, *Rubus Dalibarda*, *R. strigosus*, *Pyrus Americana*, *Ribes prostratum*, *Aralia hispida*, *Viburnum lantanoides*, *Lonicera cærulea*, *Diervilla trifida*, *Chiogenes hispidula*, *Ledum latifolium*, *Polygonum cilinode*, *Myrica Gale*, *Trillium erythrocarpum*. Especially noticeable for their beauty were the *Cornus Canadensis*, which grew in great snowy white beds in open places among the pines, both the *Kalmia angustifolia* and *K. latifolia*, *Cypripedium acaule*, *Clintonia borealis*, though this was a little past its prime, and the *Sisyrinchium angustifolium*. The latter made the meadows blue, and elicited expressions of admiration from every one. Its flowers exceeded in size any-

thing that we had ever seen, and rivalled those of the beautiful *S. Arizonicum.* A white-flowered form was several times collected. But most gorgeous of all the plants found was the brilliant *Rhododendron canescens.* The woods, both deep and open, were ablaze with it in every direction, and the air laden with its delicious fragrance. This plant has the color of the *R. nudiflorum*, but much richer and deeper. It is unquestionably distinct, and was of special interest, as its genuineness as a species has long been seriously questioned. *R. Canadense*, and *R. maximum* were also found. Three species of *Ilex*, namely: *lævigata*, *monticolor* and *dubia*, *Prunus Pennsylvanica*, *Drosera rotundifolia*, *Callitriche heterophylla* and *C. verna*, *Oxycoccus macrocarpus* and *O. palustris* were also collected with interest. Among orchids we were pleased to find *Corallorhiza multiflora* and *Goodyera repens*, the latter in bud. Eleven species of *Carex* were noticed among them the *folliculata*, *trisperma*, *echinata*, and *varia.* Among grasses we were pleased to obtain the *Oryzopsis juncea* and *Aira flexuosa.* Five species of *Lycopodium*, namely: the *annotinum*, *clavatum*, *complanatum*, *lucidulum* and *obscurum*, were collected.

Lastly, and perhaps ranking third in order of importance among all our collections, was the discovery by Mrs. Britton of the most rare *Botrychium simplex.* Other interesting ferns were collected, but my list is already too long.

After the return of the rest of the party, Dr. and Mrs. Britton, Miss Timmerman and Dr. Schœney remained at the Deleware Water Gap for a day or two and were rewarded by some most interesting discoveries. They added 33 to the number of species collected. Among the more interesting of them were *Prunus pumila*, *Rosa humilis*, *Rubus odoratus*, *Comandra umbellata*, both species of *Woodsia*, *Rosa rubiginosa*, *Rhus typhina*, *Veronica Anagallis* and, exceeding all others in importance, the rare fern, *Asplenium montanum.* In concluding my report upon this most important meeting, I can only express the hope that when a similar excursion is arranged during the coming year it will be much more highly appreciated, and largely attended by those members absent on this occasion.

On June 15th a meeting was held in the neighborhood of Grassmere, Staten Island, at which 63 species were collected,

among them *Oxalis violacea*, *Trifolium hybridum*, *Lonicera sempervirens*, *Galinsoga parviflora*, *Calopogon tuberosus*, with the *Pogonia* which almost always accompanies it, *Aletris farinosa*, *Lilium erectum*, *Tilia Americana* and *Peltandra Virginica*.

On June 22nd a very interesting meeting was held at Crugers, New York, and 56 species collected. Of especial interest was the *Silene inflata*, *Erigeron ramosus*, *Lobelia spicata*, and *Cimicifuga racemosa*.

At Fort Lee on the 29th of June, 90 species were collected. Of special note were *Hesperis matronalis*, *Rhus typhina*, *Trifolium hybridum*, *Sedum acre*, *Convolvulus arvensis*, *Carpinus Caroliniana*, *Lilium Canadense*, *Ruppia maritima*, *Conium maculatum*, *Hieracium venosum* and *Galinsoga parviflora*.

It having been decided by the Club inadvisable to hold meetings during the warm weather, no card was issued until September.

On the 7th of September, by the kind invitation of Mr. E. S. Miller, we were to hold a meeting at Floral Park, Long Island. But the day was so very stormy that but a single member presented himself at the railway station, and he returned. So far as I am informed the meeting of September 14th at Erastina, Staten Island, was postponed for the same reason.

On the 21st of September your speaker was to conduct a meeting at Snake Hill, New Jersey. Business unavoidably detained him, and he has received no report beyond the fact that a good time was enjoyed.

On Sept. 28th Dr. Britton conducted a meeting at Crugers and Verplanck's Point, when 45 species were collected. Most interesting finds were *Solidago squarosa*, *Asters undulatus*, *patens*, *multiflorus*, *Novi-Belgii*, *diffusus*, *Silene inflata*, *Echium vulgare*, *Helianthus giganteus*, *Lonicera parviflora*, *Gentiana Andrewsii*, *Bouteloua racemosa*, *Phaseolus helvolus*, *Calamintha Clinopodium*, *Viburnum pubescens* and *Arenaria Michauxii*.

Excursions were arranged for Oct. 5th to Van Courtlandt, New York, and on Oct. 12th to Little Ferry, New Jersey. Of neither of these meetings have I received any report. Neither have I received a report on meeting of Nov. 5th at Grassmere, Staten Island.

H. H. RUSBY,

NOVEMBER 26, 1889. *Chairman Field Committee.*

TORREY BOTANICAL CLUB.

CONSTITUTION AND BY-LAWS

WITH

LIST OF MEMBERS.

MAY, 1889.

CONSTITUTION.

I. NAME.

The name of this society shall be THE TORREY BOTANICAL CLUB.

II. OBJECTS.

The objects of the Club shall be to collect and diffuse correct information on all topics relating to Botany, and to promote a taste for the same.

III. OFFICERS.

The officers of the Club shall consist of a President, a Vice-President, a Treasurer, a Corresponding Secretary, a Recording Secretary, an Editor, Associate Editors (not to exceed five in number), a Librarian, and a Curator, who shall constitute a Board of Trustees in whom the corporate rights of the Club shall be vested. They shall be annually elected by ballot, and shall hold their offices for one year, and until others are installed in their places. At such election the presiding officer shall appoint two persons to receive and count the votes given thereat.

If a vacancy shall happen in any of the offices of the Club, it may be filled by special election at a regular meeting of the Club, due notice having been given by the Recording Secretary, and the person so elected to fill a

vacancy shall hold his office until the next annual election, or until his successor is chosen.

IV. PRESIDENT.

The President shall preside at all meetings of the Club, and exercise all the powers and authority usually pertaining to a presiding officer.

V. VICE-PRESIDENT.

In the absence of the President, the Vice-President shall preside, and in case neither the President nor Vice-President be present, the Club shall choose a chairman *pro tempore*.

VI. TREASURER.

The Treasurer shall collect and keep the funds and securities of the Club. Out of such funds he shall pay the ordinary current expenses of the Club, and such other sums as may from time to time be ordered. He shall report to the Finance Committee all members six months in arrears for dues. All payments to be made by the Treasurer exceeding $25, except the monthly expenses of the Bulletin, shall be approved by the Finance Committee, unless otherwise ordered by the Club. The Treasurer's books shall be audited by the Finance Committee at least once every year.

He shall render a report of the finances of the Club at the Annual Meeting, or oftener if requested.

VII. CORRESPONDING SECRETARY.

The Corresponding Secretary shall conduct the Correspondence of the Club; notify corresponding members of their election; and prepare all letters to be written in its name, retaining copies of the same. All letters and papers addressed to the Club shall be received and read by him, and disposed of in such manner as the Club may direct.

VIII. RECORDING SECRETARY.

The Recording Secretary shall have charge of the Charter, Seal, Constitution and By-Laws, and the Records of the Club. He shall give due notice of all meetings of the Club, and shall keep full and accurate records of its proceedings. He shall notify each active member of his election, and report his name and residence to the Treasurer.

IX. EDITORS.

The Editors shall edit and supervise all the publications of the Club, and exchange and distribute them subject to their discretion.

X. LIBRARIAN.

The Librarian shall have charge of all books, pamphlets, and other printed matfer belonging to the Club, and shall report the condition of the same at the Annual Meeting.

XI. CURATOR.

The Curator shall have charge of the Herbarium, Seeds, Plants, Models, and other such objects as may come into the possession of the Club, and be placed in his care, and shall report the condition of the same at the Annual Meeting.

XII. MEMBERS.

The Club shall consist of active, corresponding and honorary members. The active members shall be such as are elected under that designation, and conform to the regulations of the Club. Corresponding members may hold seats at the meetings of the Club, and may make such suggestions for the promotion of its objects as they may think proper, but shall not be eligible to office or entitled to vote. Honorary members may be chosen from botanists who have distinguished themselves through valuable original investigations, and shall be limited in number to five.

XIII. ELECTION OF MEMBERS.

Candidates for membership shall be proposed at a regular meeting of the Club, and be voted for at the next ensuing regular meeting, if the nomination be approved by the Committee on Admission. But upon unanimous consent of the members present, the persons so approved, may be elected at the same meeting at which they are proposed. They shall be severally voted for by ballot, and three black balls shall exclude. Ladies may be proposed and elected in the same manner as other members.

XIV. ANNUAL DUES.

Each active member, upon his election, and annually thereafter, shall pay to the Treasurer the sum of four dollars, which shall include all publications of the Club.

XV. PRIVILEGES OF MEMBERS.

Each active member shall be entitled to vote, and be eligible to office; to consult the Club's Library and Herbarium.

XVI. WITHDRAWAL OF MEMBERS.

A member may at any time withdraw from the Club, on giving notice to the Recording Secretary and paying such sums as he may owe to the Club.

XVII. DELINQUENT MEMBERS.

Any member who, after due notice, shall, for the space of six months, neglect to pay his annual dues, shall cease to enjoy his privileges of membership until the same are paid.

XVIII. EXPULSION OF MEMBERS.

The Club reserves to itself the right of expelling unworthy members.

XIX. STANDING COMMITTEES.

All Standing Committees created by the By-Laws shall be appointed by the President.

XX. FISCAL YEAR.

The Fiscal Year shall commence on the first day of January, and all annual assessments shall be deemed and taken to be due at that time.

XXI. MEETINGS.

The Regular Meetings of the Club shall be held on the second Tuesday of every month, at such hour and place as the club may direct. Nine members shall constitute a quorum for the transaction of business. The President may call special meetings upon his own motion.

XXII. AMENDMENTS.

Amendments to this Constitution must be proposed in writing, at a regular meeting of the Club, entered on the minutes, and referred to a Committee, who shall report thereon at the next regular or special meeting; and at the regular or special meeting next thereafter ensuing (special notice having been given by the Recording Secretary) a vote by ballot shall take place on the proposed amendment; and if the same be approved by two-thirds of the members present, it shall thereafter form a part of this Constitution.

BY-LAWS.

Adopted on the 25th of March, 1873. Amended January 10th, 1882.

Amended April 10th, 1888.

I. TIME OF ELECTIONS.

All the officers mentioned in the Constitution of this Club shall, after the first election, be elected at the first regular meeting in January in each year, and shall enter on the duties of their respective offices immediately thereafter.

II. NOTICE OF ELECTION

After the first election of officers by the corporators of the Club, at least five days' notice of every annual election shall be given to each regular member by the Recording Secretary.

III. MODE OF BALLOTING.

The officers shall be elected separately by ballot, except that, by a vote of two-thirds of the members present, they may be balloted for upon a single ticket.

IV. ORDER OF BUSINESS.

The regular business meeting of the Club shall precede the social meeting thereof, and the following shall be the order of regular business at all meetings of the Club:

1. Reading the minutes of the last meeting.
2. Nomination of new members.
3. Reports of Committees.
4. Deferred and new business.
5. Election of new members.
6. Reading of communications.

V. FINANCE COMMITTEE.

There shall be a Finance Committee which shall consist of two persons, whose duty it shall be to examine and approve all bills against the Club before the same are paid by the Treasurer, unless the same are less than $25, excepting the monthly expenses of the Bulletin of the Club. All debts contracted by any committee must be approved by such committee before being presented to the Treasurer or the Finance Committee. It shall be the duty of the Finance Committee to invest the funds of the Club, whenever there may be a balance in the Treasury of more than five hundred dollars not wanted for immediate disbursement. No transfer of any stock, bond, note, or other evidence of debt standing in the name of the Club, shall be made except by the Treasurer, having the written order of the Finance Committee for that purpose; and all transfers shall be countersigned by the President or Vice-President. It shall also be their duty to examine and audit the Treasurer's accounts.

VI. COMMITTEE ON ADMISSIONS.

The President shall annually appoint a Committee on Admissions consisting of two members, who shall consider all nominations for membership and recommend candidates for election.

VII. COMMITTEES ON LOCAL FLORA.

There shall be appointed upon the adoption of this By-Law, and at each regular Annual Meeting thereafter, two distinct Flora Committees of three members each; one for Phænerogamia, and one for Cryptogamia, whose duty

it shall be to prepare complete and accurate lists of all the plants, native, naturalized, and adventive, occurring within one hundred miles of New York City, and to have such lists published, with as much description and illustration as they shall deem best, and as the funds obtainable for the purpose shall warrant.

VIII. HERBARIUM AND LIBRARY COMMITTEE.

This Committee shall consist of the Librarian, Curator, and two members chosen at large. They shall make rules for the government of the Herbarium and Library, and report the same to the Club for approval. They shall also have power to solicit and receive donations to the Herbarium and Library, and carry out the wishes of the donors, subject to approval as above.

IX. DONATIONS AND BEQUESTS.

All donations and bequests shall be sacredly appropriated to the object designated by the donor; and the amount and descripton of each donation, with the name of the donor, shall be registered in a book kept for that purpose, and in the minutes of the Club.

X. AMENDMENTS TO THE BY-LAWS.

Amendments to the By-Laws shall be prepared in writing and referred to a committee, who shall report them at the next regular meeting, and such amendments may be voted on, at the same or any subsequent meeting.

List of Members.

Revised and Corrected May, 1889.

The following list of active, corresponding and honorary members has been prepared under the resolutions of the Club adopted at the meeting held on March 12th, 1889, viz:

Resolved: That the Secretary be authorized to have reprinted, with corrections to date, the Constitution and By-Laws and List of Members, and to distribute the same.

INCORPORATORS OF THE CLUB.

---

*Torrey, John, M. D.

Allen, T. F., M. D.
*Austin, Coe F.
†Bower, William
†Bumstead, F. J., M. D.
†Buchanan, Isaac
*Darby, John
Day, W. DeF., M. D.
†Denslow, Herbert,
†Eaton, Prof. D. C.
†Fischer, W. L.
†Forman, W. H.
†Gerard, C. B.
*Gross, O. R., M. D.
†Hall, Prof. I. H.
†Hogg, James
†Hyatt, James
*Leggett, William H.
†Leroy, P. V.
†Merriam, James S.
*Morris, O. W., M. D.
†Perry, O. H.
†Pollard, F. A.
Redfield, J. H.
†Rockwith, F. A.
*Ruger, M.
†Thurber, George, M. D.
†Ward, J. W., M. D.
*Wilber, G. M.

*Deceased. †Resigned.

Active Members.

MAY, 1889.

YEAR ELECTED.

1888 Agard, Miss Sarah J..8 E. 46th St., New York City.
1873 Allen, T. F., M. D....10 E. 36th St., New York City.
1885 Allen, Prof. J. A..Am. Mus. Nat. Hist., N. Y. City.
1881 Amend, O. P.....205 Third Ave., New York City.
1883 Barnes, Miss E. L...2050 Madison Ave., N. Y. City.
1873 Barstow, J. W., M. D.....Flushing, N. Y.
1886 Beutenmuller, W...182 E. 76th St., New York City.
1880 Bicknell, Eugene P.....Box 2958, New York City.
1887 Boyer, C. S .....Elm, Camden Co., N. J.
1887 Brewster, Miss C. M.,
89 Pierrepont St., Brooklyn, N. Y.
1888 Briggs, S. A.....15 Cortlandt St., New York City.
1879 Britton, Mrs. Elizabeth G.....New Dorp, N. Y.
1877 Britton, N. L., Ph. D....Columbia Col., N. Y. City.
1875 Brown, Hon. Addison....233 E. 48th St., N. Y. City.
1888 Bryce, Wm., Jr....40 W. 54th St., New York City.
1886 Cannon, Miss E....58 W. 33d St., New York City.
1884 Carter, C. R...1155 Magnolia Ave., Elizabeth, N. J.
1886 Carter, H. C.....Waiahua, Hawaiian Islands.
1874 Cassebeer, H. A., Jr., 292 Sixth Ave., NewYork City.
1877 Chorlton, William.....West New Brighton, N. Y.
1877 Clark, Miss E. V., Clarendon Hotel, New York City.
1884 Congdon, Ernest A...31 Broadway, New York City.
1883 Constantini, Miss Frederica, 157 E. 49th St., N.Y.City
1886 Cowdin, Mrs. Winthrop, 67 E. 54th St., N. Y. City.
1881 Cox, C. F.....100 E. 17th St., New York City.
1887 Crittenden, Claud...Steinway Hall, New York City.
1888 Dash, Miss Agnes....Kingsbridge, New York City.
1880 Day, Prof. E. H..1187 Lexington Ave., N. Y. City.
1873 Day, W. De F., M. D....56 E. 34th St., N. Y. City.
1887 Delafield, M. L., Jr.....475 Fifth Ave., N. Y. City.
1889 Doughty, Mrs. Alla,
"The Rutland," W. 57th St., New York City.
1885 Dows, Miss Mary.....1 E. 69th St., New York City.
1884 Dunbar, John B.....Bloomfield, N. J.
1883 Eadie, E. M.....Mariners' Harbor, N. Y.
1887 Eccles, Robt. G., M.D., 191 Dean St., Brooklyn, N.Y.

1887 Edwards, Henry, 185 E. 116th St., New York City.
1888 Fernie, Miss Kittie O.,
1175 Bushwick Avenue, Brooklyn, N. Y.
1884 Gaskin, Miss H. C., 118 E. 82d St., New York City.
1882 Glass, Miss Belle, 209 W. 21st St., New York City.
1887 Greene, Miss Jeannette, M. D.,
56 W. 55th St., New York City.
1888 Gregory, Miss Emily L., Ph. D.,
University of Penn., Philadelphia, Pa.
1887 Gress, Jacob J.,....1343 First Ave., New York City.
1888 Halsted, Miss Irene, 353 E. 62d St., New York City.
1885 Hamilton, Miss Fanny,
128th St. & Fifth Ave., New York City.
1887 Havard, Valery, M. D....Fort A., Lincoln, Dakota.
1886 Hays, George D., M. D., 324 E. 50th St., N. Y. City.
1888 Heller, Miss L. R...115 E. 82d St , New York City.
1880 Henshaw, Samuel.....New Brighton, N. Y.
1887 Herrman, Mrs. Henry, 59 W. 56th St., N. Y. City.
1888 Heylyn, Mrs. Edward....Box 1098, New York City.
1882 Hitchcock, Miss F. M....41 W. 73d St., N. Y. City.
1882 Hogg, Thomas.....1495 Broadway, New York City.
1877 Hollick, Arthur.....New Brighton, N. Y.
1883 Hollins, Miss.....22 W. 43d St., New York City.
1883 Hulst, Rev. Geo. D., 15 Himrod St., Brooklyn, N.Y.
1887 Jelliffe, S. Ely.....196 Sixth Ave., Brooklyn, N. Y.
1886 Jevons, Thomas E.,
301 Produce Exchange, New York City.
1885 Julien, Miss Fannie, 964 Lexington Ave., N. Y. City.
1887 Kain, Prof. C. H., 1531 Centennial Ave., Phila., Pa.
1881 Krout, A. F. K., A. M.....Coplay, Pa.
1880 Kunz, Mrs. George F., 408 Garden St., Hoboken, N.J.
1887 Le Brun, Mrs. P. L.,
103 Joralemon St., Brooklyn, N. Y.
1887 Lee, H. C.....127 E. 21st St., New York City.
1888 Leeming, Miss Helena, D.,
216 Park Pl., Brooklyn, N. Y.
1887 Lighthipe, Rev. L. H.....Woodbridge, N. J.
1882 Marshall, Miss Harriet, 108 E. 23d St., N. Y. City.
1886 Martens, J. W., Jr., 40 Warren St., New York City.
1883 McCabe, Miss Phœbe A.....White Plains, N. Y.
1887 McCredy, Mrs. D. A., 222 W. 23d St., N. Y. City.

1883 Merrill, F. J. H.,
184th St. & Sedgwick Ave., New York City.
1886 Miller, E. B.....244 Madison St., New York City.
1889 Miller, E. S.....Floral Park, L. I.
1887 Mitchell, W. R....149 W. 21st St., New York City.
1880 Morgan, Miss Maria..110 E. 82d St., New York City.
1889 Muller, Herman J..117 Chambers St., New York City.
1885 Murray, Miss M. E..222 W. 20th St., New York City.
1878 Newberry, J. S., M. D., LL. D.,
Columbia College, New York City.
1886 Northrop, John I., Ph. D.,
School of Mines, New York City.
1883 Oberdorfer, George.1076 Third Ave., New York City.
1886 Ogden, Henry.....11 Pine St., New York City.
1884 Poggenburg, J. F...447 E. 57th St., New York City.
1882 Pool, Frank J. .....3 Broad St., New York City.
1888 Porter, Prof. T. C. .Lafayette College, Easton, Pa.
1889 Potter, Miss Gertrude B., 25 W. 48th St., N. Y. City.
1886 Ramsperger, Gustavus...232 E. 32d St., N. Y. City.
1873 Redfield, J. H..216 W. Logan Sq., Philadelphia, Pa.
1882 Rich, Miss Alice B..279 Alexander Ave., N. Y. City.
1887 Rignell, Geo.....Flushing, L. I.
1884 Robertson, Miss E...160 S. 5th St., Brooklyn, E. D.
1888 Robinson, Mrs. Sarah D.,
339 W. 57th St., New York City.
1881 Rogers, Miss J. E.....314 E. 20th St., New York City.
1888 Rowley, Miss Lena,
452 Classon Ave., Brooklyn, N. Y.
1878 Rudkin, William H.,74 William St., New York City.
1887 Rusby, H. H., M. D., 254 Clifton Ave., Newark, N. J.
1876 Schrenk, Prof. Joseph, Hoboken Acad., Hoboken, N. J.
1887 Schultze, E. A.....Box 56, New York City.
1875 Shoeney, L., M. D., 68 E. 104th St., New York City.
1889 Smith, Mrs. H. L., 162 W. 123d St., New York City.
1885 Staats, Miss M. A. 104 E. 23d St., New York City.
1886 Stabler, Miss Louise M.,
135 Willow St., Brooklyn, N. Y.
1883 Steele, Miss Maria O.,
138 Montague St., Brooklyn, N. Y.
1888 Strong, Mrs. Theron G.. 38 W. 52d St., N. Y. City.
1889 Sutro, Mrs. Mathilde....60 W. 49th St., N. Y. City.

1887 Timmerman, Miss C. A., 305 E. 53d St., N. Y. City.
1877 Van Brunt, Cornelius...319 E. 57th St., N. Y. City.
1887 Van Brunt, Mrs. Cornelius, 319 E. 57th St., N.Y. City.
1873 Wall, John L.....338 Sixth Ave., New York City.
1873 Willis, O. R., Ph. D., White Plains, New York City.
1874 Wingate, Miss H. S., 12 W. 125th St., N. Y. City.

Honorary Members.

Henri Baillon, Botanic Garden of the Faculty of Medicine, Paris, France.
Alphonse De Candolle.....Geneva, Switzerland.
Joseph Dalton Hooker, M. D., F. R. S., Kew Gardens, England.
C. J. Maximowicz, Botanic Gardens, St. Petersburg, Russia.
Sachs, Dr. Julius, Wurzburg, Germany.

Corresponding Members.

Alexander, Prof. W. D.....Honolulu, Hawaiian Islands.
Ami, Henry M.....Ottawa, Canada.
Archevaleta, Don José..... Montevideo, Uruguay.
Arnold, Miss Isabel S.....Plainfield, N. J.
Ayres, Rev. William H.....Wickford, R. I.
Bailey, Prof. L. H.....Cornell University, Ithaca, N Y.
Bailey, Prof. W. W.....Providence, R. I.
Bastin, Prof. E. S.....Chicago, Ill.
Beal, Prof. W. J.....Agricultural College, Michigan.
Beauchamp, Rev. R. W.....Baldwinsville, N. Y.
Bebb, M. S.....Rockford, Ill.
Bessey, Prof. C. E.....Lincoln, Neb.
Best, G. N., M. D.....Rosemont, N. J.
Biddlecomb, Miss H. J.....Columbus, Ohio.
Bigelow, R. P.....Washington, D. C.
Birdsall, J. H.....Tom's River, N. J.
Booth, Miss M. A.....Longmeadow, Mass.
Briggs, Geo. E.....Trenton, N. J.

Bright, Marshall H.....Tarrytown, N. Y.
Brown, R. W.....Brooklyn, N. Y.
Briosi, Prof. Giovanni.....Pavia, Italy.
Burgess, T. J. W., M. D.....London, Ont., Canada.
Burrill, T. J.....Champaign, Ill.
Campbell, Prof. Douglas H.....Bloomington, Ind.
Canby, W. M.....Wilmington, Del.
Carruth, Prof. J. H.....Lawrence, Kan.
Chapin, W. H., M. D.....Springfield, Mass.
Chapman, A. W., M. D.....Apalachicola, Fla.
Claypole, Prof. E. W.....Akron, Ohio.
Claypole, Mrs. Katharine B.....Akron, Ohio.
Cook, Miss Mary C.....Buffalo, N. Y.
Cook, O. F.....Syracuse, N. Y.
Cooley, Miss G. E.....Wellesley College, Mass.
Coville, Fred. V.....Washington, D. C.
Cox, Hon. J. D.....Cincinnati, Ohio.
Cummings, Miss Clara E.....Wellesley College, Mass.
Cutter, Miss Etta V.....Lee High School, Lee, Mass.
Davenport, George E.....Medford, Mass.
Davis, J. J.....Racine, Wis.
Day, Hon. David F.....Buffalo, N. Y.
Deane, Walter.....Cambridge, Mass.
Denslow, Herbert.....Seneca Falls, N. Y.
De Thuemen, Baron F.....Beiruth, Bavaria.
Dunham, Edward K., M. D.....New York City.
Eaton, Prof. D. C.....New Haven, Conn.
Eckfeldt, J. W., M. D.....Philadelphia, Pa.
Everitt, Miss Mary.....Chicago, Ill.
Farlow, Prof. W. G.....Cambridge, Mass.
Faxon, Edwin.....Cambridge, Mass.
Fernow, B. E.....Washington, D. C.
Fischer, W. L.....New York, N. Y.
Fowler, Rev. James.....Kingston, Canada.
Gansby, Robert.....Guelph, Canada.
Goldie, James.....Guelph, Canada.
Goodale, Prof. George L.....Cambridge, Mass.
Greene, Prof. Edward Lee.....Berkeley, Cal.
Grindley, Rev. A. D.....Clinton, N. Y.
Hall, I. H., LL. D.....New York, N. Y.
Hallowell, Prof. Susan M.,.....Wellesley College, Mass.

Halstead, Prof. Byron D.....New Brunswick, N. J.
Harvey, Prof. F. L.....Orono, Me.
Hastings, Rev. J. C.....Clinton, N. Y.
Hazen, Miss Francis M.....So. Hadley, Mass.
Holden, Isaac.....Bridgeport, Conn.
Hough, Romeyn B.....Lowville, N. Y.
James, Prof. Jos. F.....Washington, D. C.
Kemp, Prof. J. F.....Ithaca, N. Y.
Lawrence, Robt. B.....Flushing, L. I.
Lesquereux, Prof. Leo.....Columbus, Ohio.
Lewis, H. A.....Carlisle, N. Y.
Livermore, Mrs. Mary A. C.....Cambridge, Mass.
Lucy, T. F., M. D.....Lowmans, N. Y.
Macloskie, Prof. George.....Princeton, N. J.
Macoun, John.....Ottawa, Canada.
Martindale, I. C.....Camden, N. J.
Meehan, Thos.....Philadelphia, Pa.
Millspaugh, C. F., M. D.....Waverly, N. Y.
Mogridge, Mrs.....Am. Mus. Nat. Hist., New York.
Morong, Rev. Thomas, Ph. D.....Ashland, Mass.
Mulford, Miss Isabel, Vassar College, Poughkeepsie, N. Y.
Nevins, Rev. R. D.....Olympia, Washington.
Newell, Miss Jane H.....Cambridge, Mass.
Owen, Mrs. M. L.....Springfield, Mass.
Paul, Prof. Joshua.....Salt Lake City, Utah.
Pearson, Mrs. Charlotte C.....Nantucket, Mass.
Peters, C. H. F., LL. D.....Clinton, N. Y.
Phillipi, Prof. Frederico.....Santiago, Chili.
Pike, Miss Clara M.....Norton, Mass.
Plowright, Chas. B.....London, England.
Poniropoulos, Prof. Eustate.....Athens, Greece.
Pooley, J. H., M. D.....Columbus, Ohio.
Pooley, Mrs. J. H.....Columbus, Ohio.
Post, G. E., M. D.....Beyreut, Syria.
Raimondi, A., M. D.....Lima, Peru.
Rau, Eugene A.....Bethlehem, Pa.
Reverchon, J.....Dallas, Texas.
Rodman, Rev. Washington.....Astoria, N. Y
Root, Oren.....Clinton, N. Y.
Rothrock, Prof. J. T.....Philadelphia, Pa.
Rust, Mrs. S. M.....Syracuse, N. Y.

Safford, Ensign W. E.....U. S. N., Washington, D. C.
Sargent, Frederick LeRoy.....Boston, Mass.
Schneck, J., M. D.....Mt. Carmel, Ill.
Schuh, Rev. R. E.....Waterville, Minn.
Scribner, Prof. F. L.....Nashville, Tenn.
Searing, Anna H., M. D.....Rochester, N. Y.
Seymour, A. B.....Cambridge, Mass.
Shattuck, Miss Lydia.....So. Hadley, Mass.
Smith, C. E.....Philadelphia, Pa.
Smith, Ernest C.....Augusta, Maine
Smith, John Donnell.....Baltimore, Md.
Smith, Prof. H. L.....Geneva, N. Y.
Southworth, Miss Effie...Agric. Dept., Washington, D. C.
Southworth, R. J., M. D.....Yonkers, N. Y.
Spaulding, Randall.....Montclair, N. J.
Spaulding, Prof. Volney M.....Ann Arbor, Mich.
Sprague, Prof. Isaac.....Wellesley Hills, Mass.
Spruce, Richard.....Coneysthorpe, Yorkshire, England.
Starbuck, Mrs. Catharine.....Nantucket, Mass.
Sturtevant, E. L., M. D.....Agric. Station, N. Y.
Tracy, Mrs. C. F.....Ripon, Wis.
Trelease, Prof. Wm.....St. Louis, Mo.
Tyler, Miss M. G.....Natal, S. Africa.
Underwood, Prof. L. M.....Syracuse, N. Y.
Vandenburg, M. W., M. D.....Fort Edward, N. Y.
Vasey, George, M. D.....Washington, D. C.
Vroom, Jas.....St. Stephens, N. B.
Ward, J. W., M. D.....Buffalo, N. Y.
Watson, Sereno, Ph. D.....Cambridge, Mass.
Weed, Walter H.....Washington, D. C.
Wilcox, T. E., M. D.....Fort Niobrara, Neb.
Willey, Henry.....New Bedford, Mass.
Williams, Miss E. B., Annie Wright Sem., Tacoma, Wash.
Williams, R. S.....Great Falls, Mont.
Wilson, Prof. W. P., M. D.....Philadelphia, Pa.
Wolle, Rev. Francis.....Bethlehem, Pa.
Youmans, Miss Eliza A.....Mt. Vernon, N. Y.